Population Change Criteria version 2.0
Users Guide

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Overview

For method overview, see the Interim Report on Viability Criteria For Willamette and Lower Columbia Basin Pacific Salmonids (McElhany et al 2003).

Input Parameters

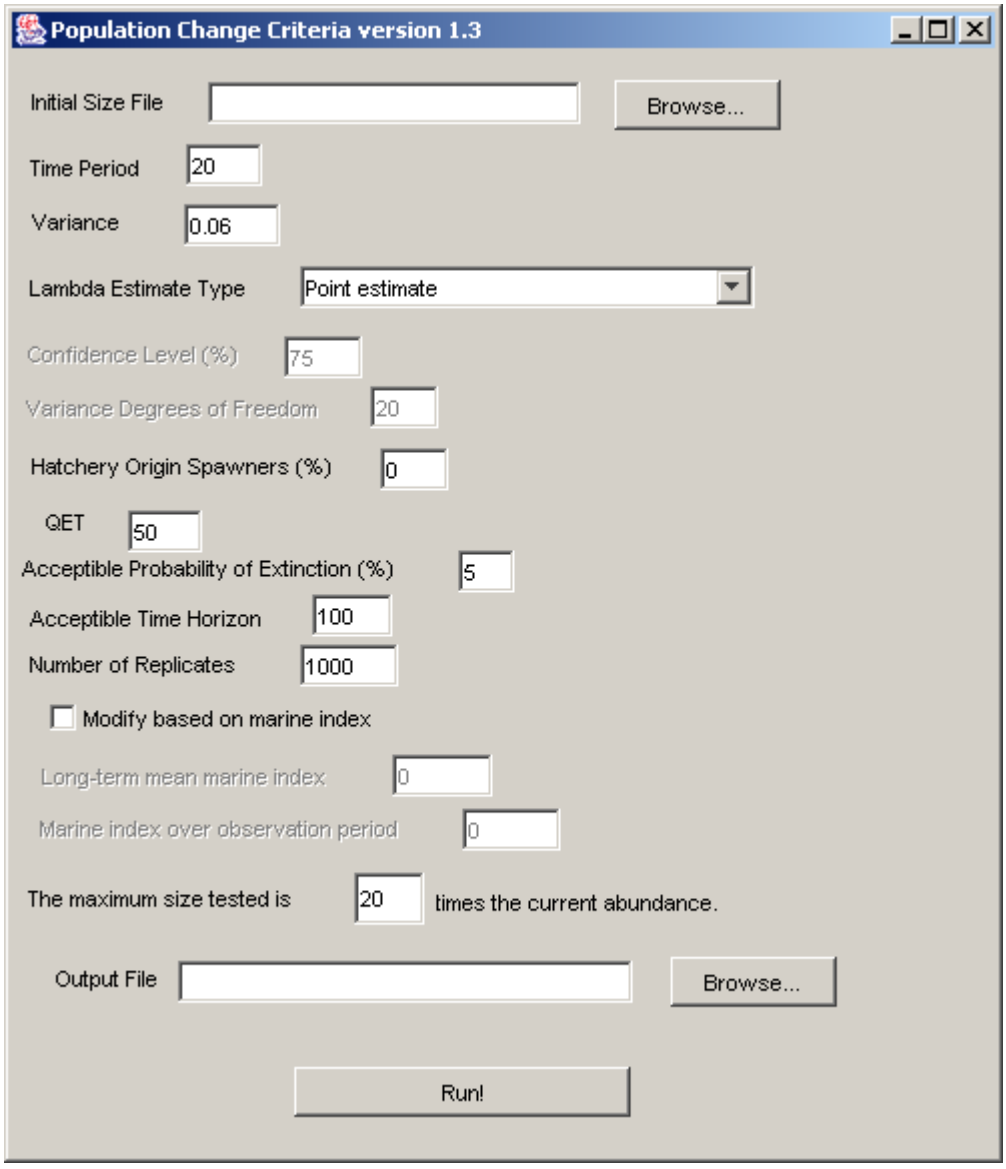

Figure 1: PCC input window.

Table 1: Description of PCC input parameters.

Parameter Name	Potential Values	Description
Initial Size File	Input file path	The "Browse…" button opens an open file dialog box for selecting the input file. The initial size file is a text file with a single number on each line. The values are initial population sizes in terms of annual natural origin spawner count. The file can have any number of lines. Input values must be greater than zero. The initial size would be interpreted as a four year average spawner count. For an example, see "example initial size file.txt".
Time period	Integer >=6	The time period in years over which the population is expected to grow. Note that the abundances are based on 4 year averages and this parameter is the number of years of data. If there are 20 years of data, there are only 16 running average values.
Variance	Decimal >0	The variance of a four year running sum of spawner counts.
Uncertainty Method	Point Estimate	Uses the point estimate of λ as α.
	C.I.: Variance Known	Calculates the target final size using the lower confidence interval on λ as α. The confidence interval is estimated assuming the variance is known with out error (i.e. infinite degrees of freedom on the variance estimate).
	C.I.: Variance estimated from dataset	Calculates the target final size using the lower confidence interval on λ as α. The confidence interval is estimated assuming the variance is assumed calculated from a time series of length Time Period using the Holmes slope method on four year running sums. Using this method the variance degrees of freedom are df = 0.21*TimePeriod + 1.04.
	C.I.: Variance df given	Calculates the target final size using the lower confidence interval on λ as α. The confidence interval is calculated using variance degrees of freedom provided by the user.
	PPI: Variance df given	Calculates the target final size as the population prediction interval. This approach uses random draws from the sample distribution of s2 and l to bootstrap the probability of extinction while taking into consideration uncertainty in the parameter estimates. In this option, the parameter distributions are estimated using a user given variance degrees of freedom.

	PPI.: Variance estimated from dataset	Calculates the target final size as the population prediction interval. This approach uses random draws from the sample distribution of s2 and l to bootstrap the probability of extinction while taking into consideration uncertainty in the parameter estimates. In this option, the parameter distributions are estimated using a user given variance degrees of freedom.
Confidence level (%)	Number between 50 and 100	Only enabled if one of the C.I. uncertainty method is selected.
Variance Degrees of Freedom	Integer >= 1	Only enabled if the C.I.: variance df given or PPI: variance df given uncertainty method is selected.
Hatchery Origin Spawners (%)	$0 \leq x \leq 100$	The average percent of spawners that are expected to be of hatchery origin. This option is currently available only for the point estimate uncertainty approach. The input into this field is the expected "effective" fraction of hatchery spawners after accounting for any differential reproductive success between hatchery origin and natural origin spawners. The input parameter may not equal the expected census count fraction of hatchery origin fish if hatchery origin spawners have a lower reproductive success than natural origin spawners. This parameter can be used to explore the possible target size consequences of hatchery fish spawning with natural origin fish.
QET	Integer >= 1	The "Quasi-Extinction Threshold" as the annual number of spawners. If a four year average of spawner counts drops below the QET value, the population is considered extinct.
Acceptable Probability of Extinction (%)	Number >0, <100	The acceptable extinction risk statement is "An Acceptable Probability of Extinction percent chance of declining to four year average of QET spawners in Acceptable Time Horizon years."
Acceptable Time Horizon	Integer >= 1	The acceptable extinction risk statement is "An Acceptable Probability of Extinction percent chance of declining to four year average of QET spawners in Acceptable Time Horizon years."
Number of Replicates	Integer >= 1	Number of simulations for extinction risk calculations. Typically 1,000 replicates provides sufficient precision on extinction risk. However, for PPI lambda estimate types, 3,000-5,000 may be necessary.
Modify based on marine index	Check box	If this option is selected, the target size is modified based on a function of the ratio of the long-term marine index, the index that would be observed over the Time Period years, and the number of Time Period years. This option is currently only available if the Point Estimate or PPI

		Uncertainty Methods are selected.
Long-term mean marine index	Number >0	This is an average measure of some long-term marine survival index. It could represent marine survival estimated from CWT, a measurement of the ocean environment (e.g. PDO) or some other metric.
Marine index over observation period	Number >0	This is the average value over the observation period of the same metric used for the long-term mean marine index. This parameter can be used for exploring the consequences of different marine survival scenarios; it is not possible to know the exact appropriate target until the Time Period has past and the actual observed marine index can be calculated.
Maximum Size Tested	Number >1	This parameter sets the maximum abundance evaluated as a possible target abundance. The maximum size is a multiple of the current abundance. If the target abundance would be larger than this size, the output is reported as ">x", where x is the Initial Size from the input file times the Maximum Size Tested parameter.
Output File	Output file path	The "Browse…" button opens an open file dialog box for naming the output file and selecting the output file path.

Output Files

The output file is formatted as tab-delimited text and can be open from Excel or any program capable of reading text files (e.g. Word). The output files have a number of header lines that describe the user specified input values that were used to create the file. Below the input information is a table with columns as described in Table 2.

Table 2: Output table column descriptions.

Column Label	Description
InitialSize	Initial population size is the taken directly from the Initial Size input file. These values represent the four year average initial number of natural origin spawners.
lambdaNat	This is the median annual Natural growth rate represented by a change in population size from InitialSize to FinalSize in Time Period years as calculated via a four year running sum. The formula if there are no hatchery origin spanwers is $\hat{\lambda} = \exp\left(\frac{\ln\left(\frac{FinalSize}{InitialSize}\right)}{y}\right)$, where y = *TimePeriod* -4. If there are hatchery origin spawners, the growth rate for natural origin spawners is $\hat{\lambda} = \exp\left(\frac{\ln\left(\frac{FinalSize}{InitialSize} * (1 - hatcheryFrac)^{y}\right)}{y}\right)$, where *hatcheryFrac* = *PercentHatcheryOrigin*/100.
lambdaLower	This column is only generated if one of the C.I. uncertainty methods is selected. This value is the lower confidence limit on Natural λ and is used as the α value input for the extinction risk calculation.
lambdaMarine IndexModified	This column is only generated if the Modify based on marine index option is selected. This value is the value of λ that is used as the α value input for the extinction risk calculation. The value in this column is drived from a formula that modifies the target size based on how much the marine survival during the observation period differs from the long-term mean marine survival. The formula is $\hat{\lambda} = \exp\left(\frac{\ln\left(\frac{FinalSize}{InitialSize}\right)}{y} - \frac{\ln\left(\frac{obsMarineIndex}{longTermMarineIndex}\right)}{y}\right)$
lambdaObs	This is the median annual growth rate calculated on the observed number of spawners. If there are no hatchery origin spawners, the observed growth rate equals the natural growth rate (lambdaNat). However, if there are hatchery origin spawners, the lamdaObs will be

	larger.
FinalSize	The finial size is the size that just gives an acceptable extinction risk. The final size is a four year average of natural origin spawners.